IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Shen et al.

Application No.: 09/945,116

Filed: August 31, 2001

Title: METHODS AND APPARATUS FOR ENCODING A VIDEO SIGNAL

Attorney Docket No.: CISCP193/3930

Examiner: Senfi, Behrooz M.

Group: 2613

Confirmation Number: 2081

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicants request review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reasons stated below:

Claims 1-2, 5-10, 12-16, 19-20, 23-26, 28-36 and 39-46 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,912,706 to Kikuchi et al. ('Kikuchi'). Claims 21-22 and 37-38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kikuchi in view of U.S. Patent No. 5,818,536 to Morris et al. ('Morris'). Applicants respectfully traverse both rejections.

Kikuchi is concerned with motion vector sensitivity during transmission and the need to prevent failures in the transmission of motion vectors from spreading (see Background, col 4 lines 51-62). He notes that propagation of a single flawed motion vector can ruin an entire

decoded picture. To overcome this problem, he codes motion vectors in a codebook and transmits motion vector codes.

Applicants maintain that Kikuchi fails to anticipate the claimed invention and teach all limitations in the independent claims.

The claimed invention recites a residual error codebook comprising a set of residual error vectors that each include an array of predetermined motion compensation errors.

The Examiner continues to misinterpret the teachings of Kikuchi. For example, to teach the claimed motion compensation error codebook, in the Response to Remarks Section on paragraph 4 of page 2 in the Office Action dated June 8, 2006, the Examiner states that Kikuchi's codebook "is clearly for motion compensation error that calculates the difference between signals 121 and 122 as shown in fig. 5, motion compensation 101." This statement is inaccurate. Kikuchi's codebook explicitly stores and codes motion vectors (see col. 18 lines 3-5). The motion vectors are used in motion compensation to assemble prediction signal 122. More specifically, the prediction circuit 201 of Fig. 6 receives a motion vector and "generates a prediction signal 122" (see Fig. 6 and col. 18 lines 6-13). Error calculator 202 then determines the difference between video signal 121 and prediction signal 122 (see Fig. 6 and col. 18 lines 14-17). Therefore, Kikuchi determines the difference between signals 121 and 122 (using a motion vector from the codebook, prediction circuit 201 and error calculator 202), and does not store a difference between signals 121 and 122 in a codebook, as the Examiner asserts.

The difference between video signal 121 and prediction signal 122 represents motion compensation error, and Kikuchi does not store this error in a codebook. Kikuchi's code book only stores motion vectors. See col. 18 lines 3-5 of Kikuchi for explicit teaching of this fact. In Fig. 5, Kikuchi computes a motion compensation error using subtractor 103, and then compresses the motion compensation error for transmission. More specifically, col. 17 lines 27-61 detail how Kikuchi computes prediction error signal 123 using subtractor 103, and then compresses prediction error signal 123 using DCT circuit 104, quantizer 105 and VLC 106. Prediction error signal 123 is not remotely described with respect to a codebook.

Claim 1, however, recites "a residual error codebook comprising a set of residual error vectors and a residual error vector index associated with each residual error vector, each residual error vector in the set of residual error vectors comprising an array of predetermined motion

compensation errors". Thus, the claims recite that motion compensation errors are stored in each residual error vector of the residual error codebook, which Kikuchi is silent on.

Kikuchi, on the other hand, **computes** motion compensation errors. See col. 18 lines 14-17 and block 202 of Fig. 6, or subtractor 103 of Fig. 5. Error calculator 202 "computes the magnitude of the difference (error) between the video signal 121 and the prediction signal 122 and generates an error level signal 211 indicating the magnitude." Error level signal 211 is used to select a motion vector from the codebook. Clearly, in fig. 5 or fig. 6, the motion compensation errors (or residual errors) are not stored in Kikuchi's code book 204, as the Examiner asserts.

The Examiner also points to the Office Action of November 16, 2005, where he states "In Kikuchi, the residual differences between the video signal and the prediction signal are vector values stored in the code book 204 with associated code book index, which is the residual vector index". Again, this is incorrect. As mentioned above, Kikuchi explicitly calculates differences between the video signal and the prediction signal, and stores motion vectors used to assemble the prediction signal.

Therefore, Kikuchi does not teach "a residual error codebook comprising a set of residual error vectors and a residual error vector index associated with each residual error vector, each residual error vector in the set of residual error vectors **comprising** an array of predetermined motion compensation errors" as recited.

Residual error has well understood meaning in the art as error produced after motion compensation has been applied (see Applicants background, for example on page 2 lines 9-17). One of skill in the art would not synonymously confuse a motion vector and a residual error. These terms cannot be interchanged for convenience of a rejection. Thus, Kikuchi's motion vectors do not teach motion compensation errors to one of skill in the art, and the claimed limitations ("residual error codebook", a "residual error vector index", or a "residual error vector") are not taught or suggested by the motion vector codebook components of Kikuchi.

For at least these reasons, Kikuchi does not teach or suggest all the limitations in independent claims 1, 7, 14, 23, 34 and 40 and the independent claims are allowable.

Dependent claims 2, 5-10, 12-16, 19-20, 23-26, 28-36 and 39-46 are also patentably distinct from the cited references for at least the same reasons as those recited above for the independent claims, upon which they ultimately depend. These dependent claims recite

additional limitations that further distinguish these dependent claims from the cited references. Also, Morris does not cure any of the deficiencies and omissions in Kikuchi. Withdrawal of the Kikuchi rejections is therefore respectfully requested.

Claims 1, 7, 14, 34, 40 and 44-46 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,826,225 to Hartung et al. ('Hartung') in view of Kikuchi. Claims 2-4, 10-11, 16-18 and 26-27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hartung in view of Kikuchi and in further view of U.S. Patent Application No. 2005/0207500 to Bober ('Bober'). Claims 5 and 36 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hartung in view of Kikuchi and in further view of Bober. Claims 21-22 and 37-38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Hartung in view of Kikuchi and in further view of Morris. Applicants respectfully traverse these rejections also.

Hartung converts input **decoded** video into: a) a combination of a codebook index and a compressed error differential, or b) standard compressed video data, depending on which of a) or b) requires lets bits. Hartung's codebook includes vectors that estimate raw video.

The Examiner also misinterprets Hartung. Hartung's codebook includes vectors that are used to best **approximate decoded video** (see col. 1 lines 59-65 and col. 2 line 63 to col. 3 line 1). Hartung's vectors do not include motion compensation errors (or any errors in video encoding). To the contrary, they resemble raw video. He then computes an error based on the difference between the input decoded video and his codebook vector approximation (see col. 3 lines 1-3). He then **separately** sends codebook indices for raw video and compressed residual errors. See col. 2 lines 38-41 for how Hartung traditionally compresses raw video error.

The codebook of Hartung includes raw video estimates. The portions of Hartung used by the Office Action do not teach or suggest the claimed invention. More specifically, col. 4 lines 7-45 describe how Hartung selects a vector that best approximates decoded video (lines 10-13), **computes** a residual error (the error is not stored in a codebook as recited) based on the difference between the input decoded video and his codebook vector approximation of raw video (lines 15-18), and **compresses the residual error** (lines 19-24). Thus, Hartung's error is compressed, and not indexed in a codebook. Hartung doesn't even do motion compensation to get an error when he uses his codebook. Therefore, Hartung also clearly fails to teach a codebook with predetermined motion compensation errors, as recited.

Hartung thus does not teach "a residual error codebook comprising a set of residual error vectors and a residual error vector index associated with each residual error vector, each residual error vector in the set of residual error vectors comprising an array of predetermined motion compensation errors" as recited

As mentioned above, Kikuchi also fails to teach these limitations. The combination of Hartung and Kikuchi thus fails to teach all the limitations in the claims or otherwise render the claimed invention unpatentable. Also, neither reference teaches or suggests a set of residual error vectors comprising an array of predetermined motion compensation errors as recited, and thus neither reference provides any teaching, suggestion or motivation to modify the other to teach the claimed invention.

Therefore, several limitations in each independent claim are not taught or suggested by Hartung and Kikuchi – alone or in combination. For at least these reasons, Hartung and Kikuchi do not teach or suggest all the limitations in independent claims 1, 7, 14, 23, 34 and 40 and the independent claims are allowable.

Dependent claims 2-4, 5, 10-11, 16-18, 21-22, 26-27, 36 and 37-38 each depend directly from independent claims 1, 7, 14, 23, 34 and 40, respectively, and are therefore respectfully submitted to be patentable over Kikuchi, Hartung, Morris and/or Bober for at least the reasons set forth above with respect to the independent claims. Further, the dependent claims recite additional elements which when taken in the context of the claimed invention further patentably distinguish the art of record.

Withdrawal of the rejections under 35 USC §103(a) is therefore respectfully requested.

I am an attorney or agent acting under 37 CFR 1.34.

Respectfully submitted,
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